

Claims

1. A catheter device having a shaft that extends from a proximal end to a distal end to carry on its distal end a self-expanding implant for intraluminal advance on a guidewire and delivery of the implant to a stenting site by proximal withdrawal of a sheath that lies radially outside the implant in the catheter, the catheter including a first shaft element to pull the sheath proximally and a second shaft element to push the implant distally to prevent the implant moving proximally with the sheath when the sheath is pulled proximally, wherein

- i) the shaft defines a flushing lumen
- ii) the shaft defines a proximal guidewire exit port that is distal of the proximal end of the shaft, for rapid exchange of the catheter with respect to the guidewire
- iii) the first shaft element is a pull wire
- iv) the second shaft element is a pusher tube.

2. Catheter as claimed in claim 1, wherein the sheath has a tapered distal tip.

3. Catheter as claimed in claim 1 or 2, wherein the pull wire is coupled to the sheath by an inner pull ring located radially inside the sheath, the pull wire and pull ring being both of metal and with a metal bond between the pull wire and the pull ring.

4. Catheter as claimed in claim 3, including an outer pull ring radially outside the sheath and the inner pull ring, with the sheath compressed between the inner and outer pull rings.

5. Catheter as claimed in any one of the preceding claims, wherein the sheath is polymeric and carries within its wall thickness a braid of metallic filaments.

6. Catheter as claimed in any one of the preceding claims wherein the pusher tube has a distal end to which is fixed side-by-side, the proximal end of a pusher-guider tube that defines a lumen for said guidewire.
7. Catheter as claimed in claim 6, wherein the pusher-guider tube is formed from a spiral metal filament and carries a stopper ring, the pusher tube, pusher-guider tube and stopper ring serving as said second shaft elements.
8. Catheter as claimed in claim 7, wherein the pusher-guider tube extends distal of the stopper ring, to the distal tip of the catheter.
9. Catheter as claimed in claim 6, 7 or 8, with an adaptor block to connect the pusher tube and the pusher-guider tube, the block defining two lumens side-by-side, one for the pusher tube and the other for the pusher-guider tube.
10. Catheter as claimed in any one of the preceding claims, including a flushing sleeve that is contiguous with the sheath and defines a lumen that contains the pusher tube.
11. Catheter as claimed in claim 10, wherein the shaft includes a guider block that has a cylindrical outside surface to receive the flushing sleeve, a guidewire lumen, and a lumen side-by-side with the guidewire lumen to receive the pusher tube.
12. Catheter as claimed in claim 11, wherein the flushing sleeve distal of the guider block includes a bellows tube.
13. Catheter as claimed in claim 11 or 12, wherein the flushing sleeve distal of the guider block includes a telescopic tube.

14. Catheter as claimed in claim 11, 12 or 13, wherein the guider block is fixed against axial movement with respect to the pusher tube and with respect to the flushing sleeve on its cylindrical surface.
15. Catheter as claimed in claim 14, wherein the proximal guidewire exit port is immediately proximal of the guider block.
16. Catheter as claimed in any one of claims 11 to 15, wherein the guider block is located around 75 cm from the distal tip of the catheter.
17. Catheter as claimed in claim 15 or 16, and including a steering tube that protrudes from said exit port and can be pulled out of the catheter and wherein the guidewire lumen continues proximally from the exit port to a second more proximal exit port, proximal of the proximal exit port, and wherein the steering tube can be pulled out of the catheter to permit a guidewire to advance proximally beyond the location of the steering tube, as far as the more proximal exit port.
18. Catheter as claimed in claim 17, wherein the more proximal exit port is defined in a hub that also defines a flushing port for introduction of flushing fluid to the flushing lumen.
19. Method of manipulating a self-expanding stent comprising the step of  
loading the stent into a rapid exchange transluminal stent delivery catheter system which releases the stent by pulling on a pull wire to pull proximally relative to the stent a sheath that lies radially outside the stent.
20. Catheter as claimed in any one of claims 1 to 18, including a self-expanding stent.

21. Method of placing a self-expanding stent comprising the steps of

- i) taking a catheter as claimed in claim 20 and advancing it to a stenting site along a guidewire
- ii) pulling on the pull wire to release the stent; and
- iii) withdrawing the catheter and guidewire after release of the stent from the catheter.